环境工程学报
Chinese Journal of Environmental Engineering

钢渣-灰岩人工湿地脱除粪便污水高氮素的实验研究

Removing nitrogen in fecal sewage with steel slag-limestone constructed wetland

投稿时间： 2010-07-09 最后修改时间： 2010-12-27

DOI：

中文关键词： 人工湿地 垂直潜流 氮 钢渣 灰岩

英文关键词:constructed wetland vertical sub-flow nitrogen steel slag limestone

基金项目:国家“水体污染控制与治理”科技重大专项（2008ZX07209-003）；华北科技学院基金资助项目（2006B-29）

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中文摘要:

构建小试系统研究了钢渣-灰岩垂直潜流人工湿地对粪便污水中高浓度氮素的降解效果。同时比较分析了填料填铺方式和表层填料对钢渣-灰岩垂直潜流湿地降解粪便污水氮素效能的影响。结果表明：当原水氨氮在42.72～272.60 mg/L，总氮在107.40～689.35 mg/L内，钢渣-灰岩垂直潜流人工湿地出水氨氮和总氮浓度可分别达到13.57 mg/L和62.83 mg/L；从长期效果来看，大级配差的正反粒径混合填铺的填料结构更有利于钢渣-灰岩人工湿地保持氮素降解效能；表层的基质材料选择要充分考虑渗透性和复氧能力；钢渣不但对氨氮有吸附作用，而且为氨氮的挥发和硝化/反硝化作用创造有利环境；灰岩在钢渣协助下溶出钙离子以利于氨氮的阳离子交换，同时为铁自养反硝化菌和脱硫杆菌的自养反硝化作用提供碳源。

英文摘要:

The purpose of this paper is to study the degradation effect of high concentration nitrogen in fecal sewage with steel slag-limestone constructed wetland. Different factors experiments impacting treatment effect were operated, such as fillings structure, surface filling and so on. The experimental results indicated that the NH_3-N and TN concentration of constructed wetland effluent attained to 13.57 mg/L and 62.83 mg/L when the NH_3-N and TN concentration ranges of raw water were 42.72～272.60 mg/L and 107.40～689.35 mg/, respentively . Then at the base of assuring effluent quality and improving quantity of treated wastewater, 60 h is the best intermittent inflow time. The bed structure having larger size difference which was mixed progressively-sized filling with anti-sized filling was more benefit for keeping long-time better degradation effect on nitrogen, and the surface filling mixed 40% soil and 60% washing sand was also the best choice because of its granularity penetrability, ability to restore oxygen. Steel slag can creat an environment which was not only benefit for adsorption and vaporizing ammonia nitrogen but also strengthen nitrification and denitrification. In addition, the calcium ion dissolved from limestone with steel slag assisting was helpful to exchanging ammonia nitrogen ion. At the same time, limestone was also a kind of carbon resource for autotrophic denitrifying bacteria including iron autotrophic bacteria and thiobacillus.

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